DOCUMENT RESUME

ED 157 174 95 EA 010 722

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TITLE The Effect of a Differential Add-On Grant: Title I and Local Education Spending.
SPONS AGENCY National Inst. of Education (DHEW), Washington, D.C.
PUB DATE [77]
CONTRACT 400-76-0019
NOTE 29p.; For related documents, see EA 010 719-721

EDRS PRICE MF-$0.83 HC-$2.06 Plus Postage.
DESCRIPTORS Educational Research; Elementary Secondary Education; *Federal Aid; *Grants; Multiple Regression Analysis; *School District Spending; Tables (Data)
IDENTIFIERS *Elementary Secondary Education Act Title I

ABSTRACT

The purpose of the present paper is to measure the effectiveness of a differential add-on grant program, Title I of the Elementary and Secondary Education Act. The evidence presented shows that this kind of grant program does increase local spending by much more than would be expected of a traditional block grant. The point estimate of the national sample is that 72 cents of each dollar of Title I funds is used to increase school spending. Although the additional specifications that have been estimated suggest that the effectiveness of Title I aid in stimulating local spending may vary among different types of school districts, the estimates support the conclusion that between 50 and 100 percent of the total Title I budget is added to local school spending. These results support the idea that differential add-on grants do operate in a unique way that deserves attention in the general analysis of intergovernmental aid. It would be valuable to examine other federal and state aid programs to assess whether the effectiveness of block grants in other fields is consistent with this distinction between differential and general add-on grants. (Author/IRT)

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THE EFFECT OF A DIFFERENTIAL ADD-ON GRANT: TITLE I AND LOCAL EDUCATION SPENDING

Martin Feldstein*

The analysis of intergovernmental grants emphasizes the difference between matching grants and block grants: matching grants lower the net price to the local jurisdiction of the favored activity while block grants are only a supplement to the income of local residents. Conventional analysis therefore implies that matching grants will have a substantially greater effect on local spending than an equal amount of aid provided in the form of a block grant.[1] Since a block grant has only an income effect, the fraction of aid spent on the favored activity only equals the community's marginal propensity to spend on that activity; a block grant is effectively a form of tax relief.[2]

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*Harvard University and the National Bureau of Economic Research. I am grateful to Daniel Erdmann for assistance with this work, to Charles Troob for helpful discussions, and to the Compensatory Education Division of the National Institute of Education, Department of Health, Education and Welfare, for useful suggestions and financial support.

[1]See W. E. Oates, Fiscal Federalism, Harcourt-Brace-Jovanovich, New York, 1972 and J. A. Wilde, "Grants-in-Aid: The Analytics of Design and Response," National Tax Journal, June, 1971, for expositions of the traditional theory of intergovernmental grants. Matching grants with a ceiling on the amount of funds that a local jurisdiction can receive (i.e., "closed end" matching grants) are behaviorally equivalent to block grants when the ceiling constraint is binding.

[2]Unless the block grant exceeds the amount that the community would otherwise have spent on the activity. In this case, the grant raises local spending by the difference between the grant and the old level of spending plus the community's marginal propensity to spend on the activity.

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In an attempt to increase the effectiveness of block grants in stimulating local spending on the favored activity, the grant giving level of government may specify an "add on" provision, "requiring" the receiving jurisdiction to spend the grant in addition to what it would otherwise have spent. Although this might be enforced in the short run by reference to the previous year's expenditure, such a provision is essentially unenforceable in the long run because it is impossible to know what the receiving jurisdiction would otherwise have spent. The "requirement" may also have some short-run effect as a form of "moral suasion" to the local government or by giving some claim on the funds to a part of the bureaucracy of the local government, but these effects can also be expected to diminish with time. In the long run, a general add-on grant for a particular type of activity should be no more effective than a pure block grant. The traditional economic literature on the effect of intergovernmental grants is therefore justified in ignoring the distinction between block grants and such general add-on grants.

There is, however, a different type of block grant that might be referred to as a "differential add-on grant." The distinguishing feature of such a grant is that it requires the local government to spend different amounts on two subgroups of the population. By mandating an <u>observable</u> difference in spending between two actual groups instead of a <u>hypothetical</u> difference between the level of spending and an unobservable alternative, the differential add-on grant provides a basis for monitoring and enforcement.

The purpose of the present paper is to measure the effectiveness of one such differential add-on grant, the federal government's program to increase local educational spending on pupils from low-income families. Title I of the Elementary and Secondary Education Act is the primary form of federal aid to students before the college level, providing add-on grants for this purpose of nearly two billion dollars in fiscal year 1977. Each state is entitled to a grant based on the number of pupils from low-income families[1] and the average per pupil level of school spending in the state. Each state then distributes its Title I funds among its school districts in proportion to the number of low-income "eligible" pupils in each district.[2] Note that an important consequence of this two-stage procedure is that two otherwise identical districts that happened to be located in different states can receive different amounts of Title I aid.

The evidence presented in this paper shows that this "differential add-on grant" does increase local spending by much more than would be expected of a traditional block grant. This is obviously important for understanding the functioning of the Title I program itself. It is also significant in indicating that the traditional analysis of intergovernmental aid should be extended to recognize this type of grant.

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[1]Since the aggregate amount to which the states are entitled under the law exceeds tha annual appropriation for the Title I program, the entitlements are reduced according to a complex set of rules that protects districts against reductions from previous funding levels, etc.

[2]The criterion of "eligibility" is actually more complex and includes AFDC recipients, institutionalized children, etc.

The first section of the paper describes the data used in this research and provides definitions of the variables of interest. Section 2 presents the basic results while the third section discusses several variants of these basic estimates. There is a brief concluding section.

1. Data and Definitions

The present study is possible because of an important new body of data prepared by the National Center for Educational Statistics (NCES) of the U.S. Office of Education. This set of data combines detailed survey information on the relevant characteristics of the school districts with demographic and economic information from the 1970 Census of Population. More specifically, the 1970 Elementary-Secondary General Information Survey collected evidence on spending patterns, the receipts from different intergovernmental grant programs and the average daily attendance from a sample of more than 4,500 school districts. At the same time, the NCES produced the School District Data Tape by recompiling the 1970 Census Fourth Count Population data for each school district with 300 or more pupils as well as for some smaller districts.[1] The NCES then merged the school survey tape with the corresponding subset of districts in the School Data Tape.[2] The result is a rich national sample of matched data on the economic behavior and population characteristics of the nation's school districts.

The effect of the Title I grants on school district spending can be estimated only because we have a national sample of school districts.

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[1]This data tape contains roughly half of the information in the original Fourth Count Census tapes. For a description of this data, see National Center for Educational Statistics, Users' Manual for 1970 Census Fourth Count (Population) School District Data Tapes (undated).

[2]The merged data is described in National Center for Educational Statistics, Users' Manual for Combined SDDT-ELSEGIS III (SDEL3) Data Tapes (undated).

Within any single state, the amount of the Title I grant received by each school district is simply proportional to the number of eligible low-income pupils. If the data were limited to the districts within a simple state, it would not be possible to distinguish the effect of Title I funds on school district spending from the effect of low-income pupils.[1] But the two-level federal structure of the Title I program implies that two identical school districts in different states would receive different amounts of Title I aid. With the current national sample it is therefore possible to identify the effect of the Title I grant.

Although the Title I program is intended to increase spending on the low-income pupils in each district, the available data does not permit an analysis of the spending pattern within school districts. The analysis presented below therefore studies the impact of Title I aid per pupil on overall local spending per pupil. More specifically, the estimates focus on total current expenditure per pupil (TCE). If a dollar of Title I aid per pupil increases TCE by one dollar, the "add on" requirement of the program can be said to be fully effective.[2] If the increase in TCE is

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[1] More formally, since the number of dollars of Title I aid per pupil would be exactly proportional to the proportion of pupils who were low income, the data would contain a perfect collinearity that would prevent estimation of separate coefficients.

[2] Even if it is "fully effective" in this sense, the low-income pupils within the district may not receive all of the additional funds. Moreover, low-income pupils might in principle receive an extra dollar of funds for every dollar of Title I aid while the local spending for other pupils was reduced; in this case, the statistical estimate would indicate that the add-on requirement was less than fully effective even though the program had achieved its goal for low-income pupils. Although the available data do not permit an analysis of these issues, the evidence that Title I aid does increase local spending and the presumption that this occurs because the differential add-on feature can be effectively monitored together imply that the additional funds go largely to the low-income population.

close to zero, the add-on requirement is ineffective and the program performs like an ordinary block grant. An increase in TCE of more than one dollar per dollar of Title I aid could occur only if the experience of the Title I program changed local tastes; e.g., if the school district decided to provide to all pupils some service or facility that was initially provided to low-income pupils under the Title I program.

The available data also permit a disaggregation of total current expenditure into instructional and noninstructional expenditures. The average "total instructional expenditure" per pupil (TIE) in the sample of school districts was $497 (in 1970) or 70 percent of the average "total current expenditure" (TCE) of $708. The major component of instruction expenditures was salaries (INSAL), averaging $461 per pupil. Separate estimates of the effect of Title I on each of these will be presented.

A substantial number of studies have examined the demographic and economic factors that influence school spending.[1] The present paper builds on this previous work in selecting the variables to include in the expenditure equations. It is useful to consider these variables in three categories: (1) factors influencing local willingness to spend on education; (2) factors affecting the cost of education services; and (3) intergovernmental aid. The remainder of this section discusses the specific variables in each category.

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[1]See M. S. Feldstein, "Wealth Neutrality and Local Choice in Public Education," American Economic Review, March, 1975, for references to earlier studies.

The income and educational achievement of the population in the school district are likely to be the most important factors influencing the willingness of the district to spend on education. The income distribution of the district is summarized by three parameters: the percentage of families with incomes below $8,000 (FLI), the percentage of families with incomes above $25,000 (FHI), and the median family income (MFI).[1] Note that because these three variables are related to each other in a complex way, the likely partial effect of any one is not unambiguous even if district educational spending is an increasing function of each individual's income. The distribution of educational achievement in the district is also summarized by three parameters: the proportion of the adult population (age 25 and over) that has graduated from high school (HSG), the proportion who attended college but did not graduate (SCOL) and the proportion of college graduates (CG).

The number of public school pupils per capita (PUP) affects willingness to spend in two contervailing ways. A larger number of pupils per capita means that each extra dollar of educational spending per pupil entails a greater burden per taxpayer; a higher value of PUP is thus like a reduction in family incomes. However, a higher value of PUP may increase local spending per pupil if it implies that a larger fraction of the voters have school children or that voters typically have larger families and therefore more intense support for educational spending.

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[1]The traditional "median voter" model would make the district's expenditure equal to the median value in the distribution of individual expenditure preferences. This need not correspond to median income or education. More generally, community spending decisions may reflect a "log-rolling process" in which spending on education and on other activities are decided together. In either case, it is appropriate to include more than just the median levels of income and education.

The age distribution of the population may also affect educational spending in a complex way. Adults between the ages of 30 and 60 are likely to provide more political support for educational spending than younger adults (with no children or with only preschool children) or older adults whose children have left school. However, the age distribution of the population also represents differences in permanent income; e.g., with a given distribution of current incomes, a higher proportion of prime age adults implies a lower permanent income. The age distribution of the population in the school district is represented by three measures: the proportion of the population who are 35 to 44 years old (A3544), the proportion 45 to 64 years old (A4564), and the proportion over age 65 (A65+).

School districts in which the use of private schools is more common may tend to offer a lower level of public school spending although this is offset to the extent that parents support high quality public primary education and then send their children to private secondary schools or support high quality public secondary education but use private (including parochial) schools for the lower grades. The number of private school pupils per public school pupil (PRIV) is included to assess the net effect of these forces.

All of the information required for these variables is provided in the Census data. Although it would have been desirable to have information on the value of local taxable property and the fraction of that value that represented non-residential property, such information is not available.

The factors affecting the cost of providing educational services of a given quality can be grouped into three classes: (1) input costs, (2) scale effects, and (3) student body characteristics. The most important input price that varies among school districts is the wage rate, especially the wage rate for teachers.[1] There is, however, a serious problem in regarding the average teacher salary paid by a district as an exogenous price that the district faces. It is more appropriate to regard school districts as facing a set of options, each option being a particular combination of teacher salary rate and teacher quality. If the salary that must be paid for each quality level varies across the country, the observed differences among school districts in the average salary actively paid reflects both the differences in the option sets that the districts face and the differences in the quality levels that they choose. Since there is no completely satisfactory way to resolve this problem with the available data, two different methods are pursued in the present study. The first approach regards the average salary paid in the state as a measure of the option set faced by all of the districts in the state; differences in the salary level among districts within the state then reflect local differences in quality. The average teacher salary in the state (TSAL) is therefore included among the explanatory variables.[2] The

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[1] We use the teachers' average annual salary to reflect the entire scale of wages faced by the school district. This might be explored further but collinearity and difficulty in obtaining data limit the potential usefulness of such analysis.

[2] This data on teacher salaries was obtained from Digest of Educational Statistics, U.S. Department of Health, Education and Welfare, Office of Education, 1970, Table 57.

alternative approach regards all differences as representing quality differences; this approach implies that all districts face the same options and therefore that no salary variable need be included in the equation.

The nonlabor inputs used by schools are generally sold in a national market at a uniform price and need not be dealt with explicitly. One important exception is the cost of heating that differs among school districts because of differences in the severity of winter temperatures. The number of degree days (TEMP) is included to adjust for differences in fuel requirements.[1]

The size of the school district may affect cost per pupil for a number of reasons. There are potential economies of scale in the provision of central services and in bulk purchases. However, large school districts may be more expensive because they represent large cities with higher than average salaries and greater than average maintenance expenses. A series of binary variables indicates whether the population is between 10,000 and 25,000 (P1025), between 25,000 and 100,000 (P25100), between 100,000 and 500,000 (P100500) or greater than 500,000 persons (P500+).[2]

Two characteristics of the pupils are included as possible influences on school expenditures. The cost of educating elementary school pupils

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[1]This variable, which is taken to be the same for all districts in the state, is obtained from the Annual Abstract of Statistics. The units are adjusted by a factor of 1000, making the mean 5.24 degree days.

[2]The omitted category of districts with less than 10,000 population has an implicit coefficient of zero. One category must be omitted to prevent perfect collinearity of the explanatory variables.

is less than the cost for pupils in secondary schools where more specialized facilities and teachers are generally used. To allow for this, the proportion of pupils who are in elementary schools (ELEM) is used. Low-income pupils more frequently have learning problems and low educational achievement. To the extent that school districts provide more resources in an attempt to compensate for this, low income pupils will add disproportionately to local educational spending. The proportion of school children from families below the poverty line (SCBPL) is included in the regression to take this into account. Since each district's Title I grant is related to the number of low-income pupils, it is important to include this variable to prevent attributing its effect to the Title I variable.[1]

Intergovernmental aid is classified into three kinds and is measured in terms of the number of dollars of aid per pupil. The first type of aid is the Title I program (TITLE I). All other aid from Federal sources is taken together (OFAID). It is difficult to classify this as block grants, add-on grants or matching grants. Often it is available on a competitive basis and requires application. Finally, there is a simple figure for state aid (STAID); although some of this represents matching grants, it is almost invariably either a general block grant or a closed-end matching grant.

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[1]Title I grants are actually based on a more complex measure of "eligible" pupils that counts children in AFDC families and certain institutions as well. As I emphasized above, each district's Title I grant also reflects the average level of spending in the state.

2. Basic Results

Total current expenditure and its two major components have been related to the variables discussed above by linear regression equations. This is obviously an approximation since it implies a constant marginal propensity to spend Title I funds as well as additive effects of the other variables; some experiments with interactions that relax these assumptions are reported below. The equations are estimated by ordinary least squares[1] with a sample of 4,690 observations.

Table 1 presents the estimated parameter values for the basic specification with the teacher salary variable included among the regressors. The coefficients of greatest interest, relating to the effect of Title I aid, are shown in the first line of the table. The estimates imply that an extra dollar of Title I aid raises local educational spending by 72 cents, of which 47 cents is for instructional expenses and 25 cents for noninstructional expenses. Instructional salaries account for slightly more than half (38 cents) of the total increase in educational spending.

The 72 cent increase in educational spending per dollar of Title I funds implies that the differential add-on requirement of the Title I program has been quite effective in directing this grant aid to additional educational spending. In contrast, a pure block grant would be expected

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[1] It might be argued that people with given economic characteristics move to particular towns that have established reputations for low or high spending on education. With this interpretation, the proportion of the population who, for example, are college graduates is a function of educational spending rather than vice versa. This suggests estimating the equations as part of a dynamic system in which location decisions and spending decisions are determined simultaneously. This more general approach has not been pursued in the current study.

TABLE 1

Effect of Title I Aid and Other Variables on Local Education Spending

Independent Variables *	Mean	Total Current Expenditure (TCE)	Total Instructional Expenditure (TIE)	Instructional Salaries (INSAL)
Aid				
Title I	22.44	0.72	0.47	0.38
		(0.12)	(0.08)	(0.07)
OFAID	34.22	0.41	0.26	0.22
		(0.04)	(0.02)	(0.02)
STAID	301.74	0.13	0.01	-0.01
		(0.02)	(0.01)	(0.01)
Income				
FLI	0.43	-64.53	-101.51	-99.29
		(80.87)	(33.58)	(30.44)
FHI	0.04	855.22	407.51	394.15
		(181.58)	(119.87)	(108.64)
MFI	10.32	3.26	3.22	2.60
		(4.22)	(2.79)	(2.52)
Education				
HSG	0.50	239.29	126.16	133.47
		(42.53)	(28.08)	(25.45)
SCOL	0.10	-303.66	-130.31	-122.25
		(87.61)	(57.84)	(52.42)
CG	0.12	48.69	128.91	87.32
		(53.93)	(35.60)	(32.27)
Age				
A3544	0.11	-582.37	-439.67	-401.68
		(166.47)	(109.89)	(99.60)
A4564	0.20	855.26	475.36	439.85
		(88.93)	(58.71)	(53.21)
A65+	0.10	25.24	173.50	129.72
		(87.47)	(57.74)	(52.33)

Table continued on next page.

Table 1 (Continued)

Independent Variables*	Mean	Total Current Expenditure (TCE)	Total Instructional Expenditure (TIE)	Instructional Salaries (INSAL)
Pupils				
PUP	0.24	-189.42 (74.71)	-146.81 (49.32)	-133.91 (44.69)
PRIV	0.08	29.46 (36.78)	-13.14 (24.28)	-31.45 (22.01)
Costs				
TSAL	9.19	7.11 (0.23)	4.72 (0.15)	4.27 (0.14)
TEMP	5.24	19.92 (1.29)	10.39 (0.85)	8.61 (0.77)
ELEM	0.69	-153.37 (56.10)	-116.09 (37.04)	-125.87 (33.57)
SCBPL	0.15	84.84 (35.36)	50.41 (23.34)	48.14 (21.15)
Population				
P1025	0.28	-27.21 (5.73)	-4.57 (3.78)	-0.65 (3.43)
P25100	0.28	-20.13 (6.45)	0.54 (4.26)	6.14 (3.86)
P100500	0.05	26.08 (10.94)	33.42 (7.22)	39.70 (6.55)
P500+	0.01	79.95 (26.60)	68.35 (17.56)	76.52 (15.91)
Constant	—	-218.22 (84.30)	-44.88 (55.65)	-2.90 (50.44)
R^2	—	0.562	0.573	0.575
SSR	—	0.8934 (10^8)	0.3893 (10^8)	0.3198 (10^8)
Mean of Dependent Variable		708.41	496.86	461.09

*See text, section 1, for definitions. Note that MFI and TSAL are in thousands of dollars.

to have little impact on spending in any particular area with most of its effect being a reduction in the local tax rate. For the Title I program, the coefficient of 0.72 implies that only 28 cents per dollar of grant aid occurs as a tax cut (or increase in other forms of public spending).[1] The standard errors of the three Title I coefficients are relatively small but should not be regarded as an adequate measure of the uncertainty of the parameter estimates. The reader can form his own judgment about the best estimate of the effect of Title I and about its uncertainty only by examining the results of alternative specifications. Before doing that, it is useful to review briefly the other parameter estimates reported in Table 1.

The coefficients of the other federal aid (OFAID) and state aid (STAID) variables confirm the relative effectiveness of the differential add-on feature of the Title I program. An extra dollar of other federal aid increases educational spending by only 41 cents. State aid is almost completely a form of tax relief; only 13 cents per dollar of state aid is added to educational spending, all of which goes for noninstructional activities.[2]

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[1] E. M. Gramlich, "Intergovernmental Grants: A Review of the Empirical Literature," International Seminar on Public Economics Conference, Berlin, January, 1976, discusses a number of recent studies of intergovernmental aid and concludes that closed end matching grants for specific areas of expenditure, although they should in principle behave like block grants and have little effect on spending, do increase government spending by approximately one dollar per dollar of aid. He suggests that these impacts are so large either because the grants themselves exceed the amounts that would otherwise be spent or because the programs have "effort maintenance" ("add on") provisions that are effectively enforced.

[2] These may be special activities like school bus services that effectively receive complete state funding.

The income variables have the expected signs and are consistent with the positively skewed distribution of educational spending. A higher proportion of low-income families reduces educational spending per pupil but by a relatively small fraction of the average level of spending. Thus an additional 10 percent of the population with family incomes below $3,000 reduces educational spending per pupil by less than $10. An increased proportion of high-income families has a relatively larger impact on spending; an extra 10 percent of the population with incomes over $25,000 raises total current educational spending by $86 and instructional expenditures by $41. Note that the median family income variable is not significant when the other two measures of the income distribution are included in the equation.

School districts in which a larger fraction of the adult population are high school graduates (HSG) spend more on education. An extra 10 percent of the population with high school degrees adds $24 to current expenditure per pupil. Note that this is for given values of the income distribution variables and other demographic characteristics. The estimates imply rather surprisingly that a greater proportion of the population with some college education but not a college degree (SCOL) actually decreases local educational spending.[1] A greater fraction of the population with a

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[1] I can imagine an explanation that those who try college and stop may value education less than those who never had the opportunity, but I prefer to regard the large negative coefficients as a statistical aberration.

college degree increases educational spending with a disproportionately large effect on instructional spending and an implied decrease in non-instructional spending.

The coefficients of the age variables imply that the population aged 45 to 64 is most willing to spend on education. An extra 10 percent of the population in this range (rather than the omitted age group of less than 35 would raise spending by $86 per pupil while a 10 percent increase in the fraction less than 35 years old (again, taken from those aged less than 35 would cut spending by $58.

An increase in the number of pupils per capita (PUP) decreases average spending per pupil, indicating that the "income effect" outweighs any effect through the changing political balance within the community. The effect is not large, an extra 10 pupils per hundred population reducing spending by only $19 per pupil. Looked at somewhat differently, the average of 24 pupils per 100 population and the average expenditure of $708 per pupil imply per capita educational spending of $170. An increase to 34 pupils per 100 population would increase average per capita spending to $234 instead of the $241 that would result with no decrease in per pupil spending. The number of private and parochial pupils as a proportion of all pupils (PRIV) has no significant effect on public educational spending.

The teacher salary variable (TSAL) is the average salary paid to teachers in the state in which the school district is located; the average teacher salary in 1970 was $9,190. Recall that this variable is used to represent all wage rates paid by the school district and not just teacher salaries. The coefficient shows the extent to which school districts

respond to higher wage rates by reducing the quantity of inputs per pupil.[1] The interpretation is easiest for expenditure on instructional salaries. If the districts' price elasticity of demand for personnel is minus one, a higher wage rate would lead to an equiproportional decrease in inputs, thus leaving instructional salary spending unchanged. More generally, the elasticity of instructional salary expenditures with respect to the salary level is equal to the estimated coefficient (4.27) multiplied by the ratio of the teacher salary to per pupil expenditure (9.1/461); the expenditure elasticity is thus 0.084, implying a quantity elasticity of -0.916 at the mean values of the variables.[2]

For total current expenditures, the expenditure elasticity with respect to the salary level is 7.11 multiplied by 9.1/708 or 0.091, implying a quantity elasticity of -0.914. This reflects the large share of salaries in educational spending and implies that the price elasticity is larger for noninstructional personnel than for instructional staff.

An increase in the number of degree days raises the average cost per pupil by $19.92 per 1000 degree days.

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[1] Recall the alternative interpretation, that the wage rate is an indicator of the quality level chosen by the local district. I return to these estimates below.

[2] This price elasticity is quite consistent with the price elasticities with respect to matching aid presented in Feldstein, op.cit., and M. Feldstein and D. Frisch, "The Effect of Matching Aid on the Level and Distribution of Education Spending," mimeo, 1977. The evidence here is also consistent with a general price elasticity greater than one but with districts choosing higher quality (at a greater salary level) as well as greater quantity.

3. Extension of the Basic Specification

I have experimented with a variety of modifications of the basic specification of Table I. Different ways of summarizing the income distribution and the distribution of educational achievement neither alter the inferences about these variables nor change appreciably the coefficient of the Title I variable. Since the private school variable and the other aid variables are arguably endogenous, I have experimented with specifications that exclude these variables completely. Again, the coefficient of the Title I variable is essentially unchanged.

More general specifications that permit all of the coefficients to differ according to the type of school district have more appreciable effects. These results indicate that the effectiveness of the Title I program in stimulating local spending may vary among different types of school districts. The simple point estimates of section 1 may be appropriate as national summaries but they must be interpreted with some caution.

Interstate Differences

It is useful to begin this analysis by considering the implication of the fact that primary and secondary education is regarded as a state responsibility and that local spending decisions take place in the context of state reputations and funding systems. Moreover, the Title I program is operated through the states; the average level of spending in the state is a basic determinant of each district's Title I aid. I explained above

why the effect of Title I aid cannot be studied with data on the districts of an individual state. It is possible, however, to allow for systematic differences among the states in educational spending by including a separate constant term for each state in the regressions of Table 1. Such individual constant terms also capture other state-specific characteristics that are common to all districts within the state, e.g., general wage rates, other climate characteristics, etc. The coefficients of such regression equations were quite similar to the standard estimates of Table 1. In particular, the coefficient of the Title I aid variable in the total current expenditure equation with individual constant terms was 0.57 with a standard error of 0.11.

The South and Other Regional Differences

Low-income pupils are relatively more numerous in southern school districts. Some 29 percent of school children in the south come from families below the poverty line,[1] while in the rest of the country only 10 percent were from poor families. As a result, Title I funds were of much greater importance in the south. The average Title I grant per pupil was $43 in the south or 8.1 percent of the total current expenditures. In the rest of the country, per pupil Title I funds were only $16 or 2.1 percent of total current expenditure. It is of particular interest, therefore, to know whether Title I is as effective in southern states as it is elsewhere in the country. The sample was therefore divided into

[1] This is actually an unweighted average of the percentages in the southern districts.

1,152 southern districts and 3,538 non-southern districts. The coefficient of the Title I variable in the total current expenditure equation was 0.45 (s.e. = 0.10) in the south and 0.81 (s.e. = 0.19) elsewhere.[1] Although the coefficients thus show a significantly lower effectiveness of Title I in the south, this may reflect other factors including the size distribution of the school districts, the greater concentration of Title I pupils in the south and the racial composition of local school districts. Despite the smaller coefficient for southern districts, the net effect of Title I on local educational expenditure is greater in the south than the north because more Title I dollars per pupil are distributed to the south; the point estimates imply increased educational spending of $19 per pupil in the south and $13 per pupil elsewhere.[2]

An attempt at further regional disaggregation of the non-south produced results that are difficult to explain. In two of the three regions, the estimated effect of Title I is not significantly different from one, while in the third region it is not significantly different from zero. More specifically, in the northcentral and northeastern regions the coefficents of the Title I variable are 0.73 (s.e., = 0.28) and 1.46 (s.e., = 0.44), while in the west

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[1] Similar differences between the south and non-south were also obtained for the components of current expenditure. For total instructional expenditure the coefficients were 0.32 (s.e., = 0.06) and 0.55 (s.e., = 0.12) for instructional salaries, the coefficients were 0.24 (s.e., = 0.06) and 0.45 (s.e., = 0.11).

[2] A variety of experiments with different specifications did not alter the basic south-north difference in the estimated effect of Title I and are therefore not reported here.

the coefficient is -0.39 (s.e. = 0.25). The most likely reason for the unstable coefficients is a collinearity between the number of Title I dollars per pupil and the proportion of school children below the poverty level (SCBPL) that exists within the regions but not in the full national sample.[1] It is of course also possible that the districts in the west do behave differently because of characteristics not represented in the regression. A more detailed analysis in which coefficients are permitted to vary by region and other variables at the same time would be needed to examine this possibility.

Low-Income Districts

Because the Title I program is concerned with low-income pupils, it is worthwhile checking that the effectiveness of the program is not lower in low-income districts where they are concentrated. Approximately 10 percent of the districts (506 out of 4,690) have average family incomes below $7,000. In these districts, an average of 41 percent of pupils are below the poverty line. To assess whether the effectiveness of the Title I program was different in these districts, the basic regressions of Table 1 were re-estimated with a separate coefficient of the Title I

[1] In the national sample, the coefficient of the SCBPL variable had a standard error of 35. With no change in collinearity, the standard error would double when the sample was divided into four approximately equal sized subsamples. While the standard error was in fact 70 in the northcentral region, it was substantially higher in the other regions: 157 and 101. Recall that within a single state the number of Title I dollars per pupil is proportional to the number of low-income pupils.

variable for these districts. It is reassuring that this test showed that low-income districts were not significantly different from the others: the coefficient of the Title I variable was 0.78 for these lowest income districts and 0.68 for the remaining districts.[1] The same procedure was repeated for the 1981 districts in which average family income was between $7,000 and $10,000. In these districts some 17.5 percent of school children were from families below the poverty line. The difference in the estimated effects of Title I was again small and statistically insignificant. The coefficient of the Title I variable was 0.62 for these low-income districts and 0.78 for the rest; the difference of 0.16 had a standard error of 0.13.[2]

Differences by School District Size

The final major variable to be considered is the size of the school district. Nearly 40 percent of the school districts in the sample have populations of less than 10,000. At the other extreme, some 5 percent of the districts have more than 100,000 persons. The sensitivity to Title I funds could differ substantially among districts of such disparate size. A school district with 1,000 pupils and $20,000 of Title I funds may be

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[1] The difference of 0.10 had a standard error of 0.13. Because there are only 506 low-income districts, a separate regression for these districts was not estimated.

[2] Because there are nearly 2,000 districts with average income in this interval, a separate regression was estimated for this subsample. The coefficient of the Title I variable was very similar to the 0.62 obtained with the more restrictive specification: 0.57 with a standard error of 0.18.

much more limited in its scope for response than a district with 10,000 pupils and $200,000 of Title I funds. The local control over school budgets and the relative importance of the voters and the school system bureaucracy will also differ with the size of the district. Large districts may be more carefully monitored in an attempt to assure compliance with the "add on" feature of the grants, but these districts may also be more difficult to regulate and more sophisticated about avoiding the "add on" requirement when they want to.

The statistical estimates are rather puzzling and point to an interaction between the school district size and the expenditure on low-income pupils that may warrant separate study. Relaxing the specification of Table 1 by allowing the coefficient of the Title I variable to differ according to the size of the district produced estimates that imply that the effectiveness of Title I aid does not vary among districts with less than 100,000 population but then rises sharply with district size.[1] However, a more general specification in which all parameters are free to vary by district size (i.e., separate regression equations for each size group) shows a quite different pattern: a substantial increase in

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[1] More specifically, districts with less than 10,000 persons have a coefficient of 0.61 (s.e. = 0.14), while those with 10,000 to 25,000 persons have a coefficient of 0.35; the standard error of the difference of 0.26 is 0.16. Similarly, with 25,000 to 100,000 persons, the coefficient is 0.85 but the standard error of the difference of 0.24 is 0.20. Among the 5 percent of the districts with 100,000 to 500,000 persons, the coefficient is an implausibly high 2.85; the standard error of the difference is only 0.44; for the 29 districts with populations of more than 500,000, the coefficient is 4.45 with a standard error of the difference equal to 0.94.

the effectiveness of Title I aid as district size grows up to a population of 100,000 but no significant effect of Title I aid above that size. In addition, the coefficient that measures the expenditure impact of the number of school children below the poverty line also varies substantially by the size of the school district. The coefficients of these two variables, drawn from the full set of coefficients estimated with a specification like that of the equations in Table 1, are:

School District Size	Number of Districts	Coefficient of Title I Aid	Coefficient of SCBPL
Less than 10,000	1,769	0.38 (0.16)	-74 (53)
10,000 - 25,000	1,334	0.77 (0.21)	120 (58)
25,000 - 100,000	1,329	1.96 (0.33)	242 (95)
100,000+	258	-1.38 (1.04)	1,553 (375)

The coefficients of the SCBPL variable imply that local school spending is much more responsive to low-income pupils in large districts than in small. The very large coefficient of SCBPL in cities with a population over 100,000 suggests that Title I aid is ineffective in such cities because substantial supplementary amounts are already spent on such pupils. Alternatively, the negative coefficient and large standard error of the Title I variable may only indicate a collinearity problem; the very large coefficient of SCBPL may reflect a misattributed impact of Title I aid. Only a more detailed

study of the impact of low-income pupils on school spending in large districts can clarify the actual process.[1]

The supplementary analyses that have been discussed in this section are difficult to summarize. The most basic conclusion is that the estimate of a single coefficient of the Title I aid variable for the complete national sample is quite insensitive to plausible changes in the specification of the equation discussed in section 2. There is also no indication that Title I aid is less effective in stimulating spending in low-income districts. Disaggregating the sample size by region and by city size does, however, produce varying estimates of the effectiveness of Title I. Because the problems of collinearity and of specification error are likely to be more severe in these subsamples, the disaggregated parameter estimates should not be accepted at face value. They do, however, imply the need for caution in relying on the single point estimates of section 2 and do point to directions for further research.

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[1] An analysis of data for large cities in the period before the Title I program would be useful in determining the importance of the collinearity problem. There is also a third possible explanation. Large cities with high levels of school expenditure per pupil may also provide more generous levels of welfare support and other aid to low-income families. Such cities may attract larger numbers of families below the poverty level. The coefficient of SCBPL may therefore be biased upward with a resulting downward bias in the Title I coefficient.

4. Conclusion

The estimates presented in this paper indicate that local school districts increase their spending by a substantial fraction of the funds that they receive through the Title I program. The point estimate for the national sample is that 72 cents of each dollar of Title I funds is used to increase school spending. Although the additional specifications that have been estimated suggest that the effectiveness of Title I aid in stimulating local spending may vary among different types of school districts, the estimates support the conclusion that between 50 percent and 100 percent of the total Title I budget is added to local school spending.

These estimates therefore imply that the Title I grants are much more effective in stimulating local spending that traditional theory predicts for block grant programs. This effectiveness of the Title I program undoubtedly results from the monitoring than is possible because the add-on requirement refers to a difference in expenditure between low-income pupils and other pupils in the same district.

These results support the idea that differential add-on grants do operate in a unique way that deserves attention in the general analysis of intergovernmental aid. It would be valuable to examine other federal and state programs to assess whether the effectiveness of block grants in other fields is consistent with this distinction between differential and general add-on grants.